

Building Successful Human-Centered Systems

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Reviewing *Intelligent Multimedia Multi-Agent Systems* by Rajiv Khosla, Ishwar K. Sethi, and Ernesto Damiani (Kluwer, Dordrecht, The Netherlands, 2000, \$135, 333 pp., ISBN 0792379799).

The systems that serve real human needs are increasingly complex and multidisciplinary. In many cases the most technologically sophisticated software systems have failed miserably, both within an enterprise and in the public domain. The reasons for these system failures have been nontechnological—for example, issues related to organizational culture and behaviors. Studying and designing a human-centered framework for system development is a critical step in minimizing the failure rate of these systems. Since system designers and programmers develop systems based on stakeholder's goals, this framework also offers the promise of estimating return on investment (ROI) on technology investments, a problem that has bedeviled the IT and business communities at large.

According to the authors of *Intelligent Multimedia Multi-Agent Systems*, they aim to “provide a framework for developing intelligent multimedia multi-agent systems based on a human-centered approach, relevant to practitioners and researchers in a wide variety of areas: human-centered systems, intelligent systems, e-commerce systems, multimedia, software engineering,” and so forth. Does their book succeed in meeting this task? It's difficult to meet so many objectives in one book. Yet the book does an admirable job in several ways.

The authors present the case for human-centered systems systematically and logically. They identify the difference between current technology-based approaches and human-centered approaches for system development. They convincingly present the motivation of why technology should be a component but not the prime

driver in system development. The authors provide motivation both from the technological and the marketing perspective. They strengthen their case when they demonstrate the current evolution of various technologies (such as e-commerce systems, data mining, software engineering, intelligent systems, and so forth) toward human-centeredness. The proposed human-centered framework pulls in a lot of work from diverse areas of research—such as work-centered design, situated and distributed cognition, activity theory, multimedia, problem-solving ontologies, and pattern-adaptor design concepts from software engineering. They also attempt to base the framework on enabling theories such as semiotics, cognitive science, and activity analysis.

In the context of the proposed framework, the authors comprehensively survey state-of-the-art research and technologies from the perspective of human-centered systems. In the case of intelligent systems, the authors discuss hard computing (involving expert system rule bases) and soft computing (involving fuzzy systems and neural networks). The authors also consider two interesting perspectives of multimedia:

- a simulation of human-centered multimedia artifacts to reduce the cognitive overload on humans when they interact with systems and
- the role of the human-centered framework in the context of multimedia information retrieval and analysis.

In an attempt to serve researchers and practitioners, the authors provide a broad overview of research literature and present examples and relevant technologies. We expect this overview to be useful to researchers and practitioners new to the area of human-centered systems.

The authors do an admirable job of discussing

a comprehensive range of technologies and integrating the technologies in the context of the human-centered framework discussed in the book. They describe the basic framework in the first five chapters and in the remaining chapters discuss applications that illustrate and motivate the framework's various design principles. They cover each area of technology sufficiently in depth so as to create a minitutorial for readers not familiar with that area. We consider Chapter 2 from this perspective. In particular, it's instructive to find in one place wide-ranging technologies—from expert systems with knowledge bases to object-oriented systems with soft approaches based on neural networks and fuzzy techniques. This helps users understand the similarities and differences, which in turn facilitates understanding how these techniques integrate into the human-centered framework.

Chapter 3, on the other hand, examines in detail the evolution of various technologies toward human-centeredness. The authors present an interesting discussion on combining different types of intelligent systems to come up with hybrid systems. They highlight the contrast between object-oriented and agent technology, explaining why agent technologies are more human-centered. In the context of multimedia databases, they propose an interesting three-level approach, where the problem-solving ontology layer captures the human-centered task knowledge.

Although the authors covered the topics comprehensively, they didn't address two technology areas closely aligned with the human-centered framework. These areas are workflow systems and systems at the boundary of human-machine cognition. A workflow system's design is organized around a collection of tasks and subtasks and is based on the human-centered approach. However, the Institute of Human-Machine Cognition in Pensacola, Florida, is performing research based on the premise that new kinds of systems are possible with the synthesis of human epistemological strengths and machine automation. They try to integrate system requirements from the technology and human-centered perspectives at a deeper task level and believe that machines should be designed as as natural extensions to human beings.

The authors demonstrate the wide applicability of their framework by applying it across an array of applications, such as medical informatics, e-commerce, sales recruitment, and game playing.

Whereas they succeed in demonstrating applicability, the value of this framework isn't brought out clearly. What exactly does the human-centered framework provide? How can we quantify the advantages of incorporating stakeholders' goals and tasks? Do these goals and tasks have an impact on improving the acceptability of the system, thus leading to a more efficient organization, in turn resulting in a higher ROI?

Answers to these questions—or methodologies for determining answers to these questions—will realize the true potential of systems based on this framework.

In spite of our observations, here are some reasons why you might consider buying and reading this book.

- *As a researcher in the human-centered approach.* It's a good reference source for research in intelligent, multimedia, and multi-agent systems. Success in covering these topics in this case seems to be moderate to high.
- *As a researcher in the intelligent, multimedia, or multi-agent systems areas.* The book will help you understand the human-centered approach for your area—success covering these topics seems to be moderate. It also provides a review of research in your own area—success seems to be low, in the case of the multiagent systems, to moderately high in the case of intelligent information systems.
- *As practitioners.* The book helps you quickly review relevant research—the success in this case is moderately high; review relevant technologies—success seems to be moderate; and understand and interlink the technological components of a solution with nontechnological ones, such as organizational or cultural behaviors and business goals and metrics.

In summation, the book is a very interesting introduction to the human-centered framework. We highly recommend this book to student researchers (particularly PhD students) interested in a human-centered approach or intelligent, multimedia, or multi-agent systems. Although it lacks formalisms to capture, specify, and quantify stakeholders' goals in a concrete manner and fails to deliver on its promise of estimating ROI (a tall order), we believe that a good start has been made and will lead to significant advances in the coming years.

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